SIEMENS

6N135
6N136

HIGH-SPEED 2.5 kV TRIOS® OPTOCOUPLER

FEATURES

- **Isolation Test Voltage: 2500 VAC_{RMS}**
- **TTL Compatible**
- **High Bit Rates: 1 Mbit/s**
- **High Common-Mode Interference Immunity**
- **Bandwidth 2 MHz**
- **Open-Collector Output**
- **External Base Wiring Possible**
- **Field-Effect Stable by TRIOS***
- **Underwriters Lab File #E52744**

Dimensions in inches (mm)

DESCRIPTION

The 6N135 and 6N136 are optocouplers with a GaAIAs infrared emitting diode, optically coupled with an integrated photodetector which consists of a photodiode and a high-speed transistor in a DIP-8 plastic package.

Signals can be transmitted between two electrically separated circuits up to frequencies of 2 MHz. The potential difference between the circuits to be coupled is not allowed to exceed the maximum permissible reference voltages.

Maximum Ratings

Emitter

Reverse Voltage ....5 V
Forward Current ....25 mA
Peak Forward Current
(t =1 ms, duty cycle 50%)...........................50 mA
Maximum Surge Forward Current
(t ≤1 µs, 300 pulses/s).....................................1 A
Thermal Resistance.................................. 700 K/W
Total Power Dissipation (T_A≤70°C) ....45 mW

Detector

Supply Voltage ....–0.5 to 15 V
Output Voltage .... –0.5 to 15 V
Emitter-Base Voltage .... 5 V
Output Current...8 mA
Maximum Output Current.............................16 mA
Base Current .... 5 mA
Thermal Resistance.................................. 300 K/W
Total Power Dissipation (T_A≤70°C) ....100 mW

Package

Isolation Test Voltage (between emitter and detector climate per DIN 40046, part 2, Nov. 74 (t=1min.) ....2500 VAC_{RMS}
Pollution Degree (DIN VDE 0109) 2
Creepage ....≥7 mm
Clearance...≥7 mm
Comparative Tracking Index per DIN IEC112/VDE 0303 part 1, Group IIIa per DIN VDE 6110 175
Isolation Resistance
V_{IO}=500 V, T_A = 25°C ....≥10^{12} Ω
V_{IO}=500 V, T_A = 100°C ....≥10^{11} Ω
Storage Temperature Range .... –55°C to +125°C
Ambient Temperature Range ...... –55°C to +100°C
Soldering Temperature (max. ≤10 sec., dip soldering ≥0.5 mm from case bottom)...260°C

***TRIOS**—**TR**ansparent **IO**n **S**hield

Characteristics (T_A=0 to 70°C unless specified, T_A=25°C typ.)

Emitter	Symbol		Unit	Condition
Forward Voltage	V_F	1.6 (≤1.9)	V	I_F=16 mA
Breakdown Voltage	V_{BR}	≥5	V	I_R=10 µA
Reverse Current	I_R	0.5 (≤10)	µA	V_R=5 V
Capacitance	C_O	125	pF	V_R=0 V, f=1 MHz
Temperature Coefficient, Forward Voltage	$\Delta V_F / \Delta T_A$	-1.7	mV/°C	I_F=16 mA
Detector				
Supply Current Logic Low	I_{CCL}	150	µA	I_F=16 mA, V_O open, V_{CC}=15 V
Supply Current Logic High	I_{CCH}	0.01 (≤1)	µA	I_F=0 mA, V_O open, V_{CC}=15 V
Output Voltage, Output Low 6N135 6N136	 V_{OL} V_{OL}	 0.1 (≤0.4) 0.1 (≤0.4)	 V V	I_F=16 mA, V_{CC}=4.5 V I_O=1.1 mA I_O=2.4 mA
Output Current, Output High	I_{CH}	3 (≤500)	nA	I_F=0 mA, V_O=V_{CC}=5.5 V
Output Current, Output High	I_{CH}	0.01 (≤1)	µA	I_F=0 mA V_O=V_{CC}=15 V
Current Gain	H_{FE}	150		V_O=5 V, I_O=3 mA
Package				
Coupling Capacitance Input-Output	C_{IO}	0.6	pF	f=1 MHz
Current Transfer Ratio				
6N135 6N136	CTR CTR	16 (≥7) 35 (≥19)	% %	I_F=16 mA, V_O=0.4 V, V_{CC}=4.5 V, T_A=25°C
6N135 6N136	CTR CTR	≥5 ≥15	%	I_F=16 mA, V_O=0.5 V, V_{CC}=4.5 V

Figure 1. Switching times

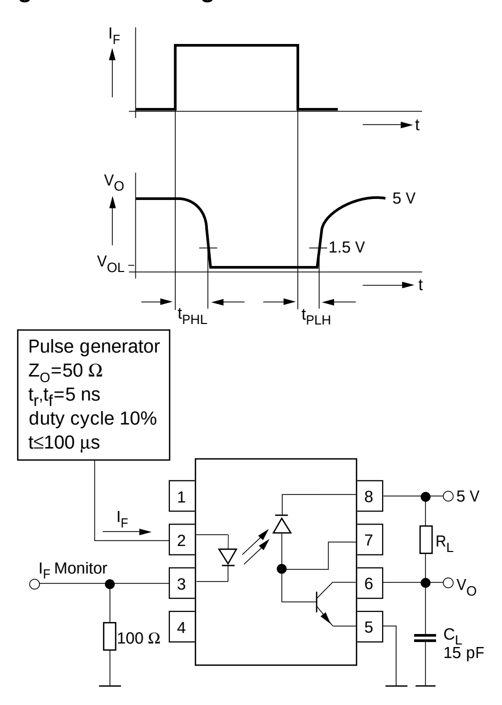
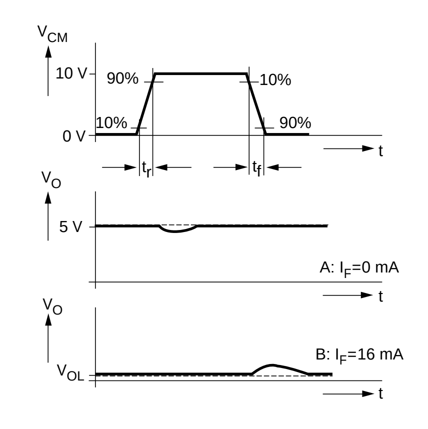
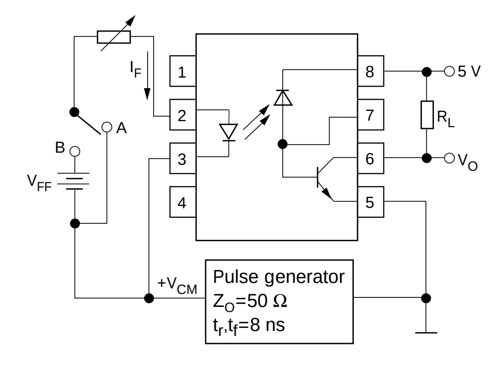


Figure 2. Common-mode interference immunity





Delay Time (I_F=16 mA, V_{CC}=5 V, T_A=25°C)

High - Low 6N135 (R_L=4.1 kΩ) 6N136 (R_L=1.9 kΩ)	 t_{PHL} t_{PHL}	 0.3 (≤1.5) 0.2 (≤0.8)	 µs µs
Low - High 6N135 (R_L=4.1 kΩ) 6N136 (R_L=1.9 kΩ)	 t_{PLH} t_{PLH}	 0.3 (≤1.5) 0.2 (≤0.8)	 µs µs

Common Mode Interference Immunity
(V_{CM}=10 V_{P-P}, V_{CC}=5 V, T_A=25°C)

High (I_F=0 mA) 6N135 (R_L=4.1 kΩ) 6N136 (R_L=1.9 kΩ)	 CM_H CM_H	 1000 1000	 V/µs V/µs
Low (I_F=16 mA) 6N135 (R_L=4.1 kΩ) 6N136 (R_L=1.9 kΩ)	 CM_L CM_L	 1000 1000	 V/µs V/µs

Figure 3. Output characteristics-6N135
Output current versus output voltage
(T_A=25°C, V_{CC}=5 V)

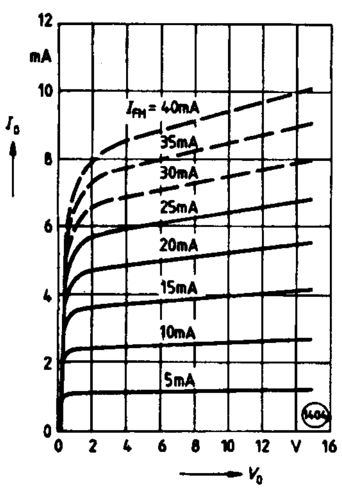


Figure 4. Output characteristics-6N136
Output current versus output voltage
(T_A=25°C, V_{CC}=5 V)

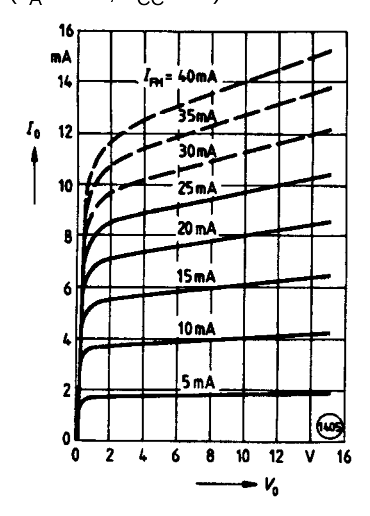


Figure 5. Permissible forward current of emitting diode versus ambient temperature

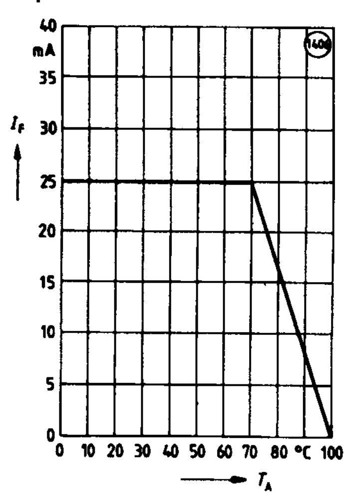


Figure 6. Permissible total power dissipation versus ambient temperature

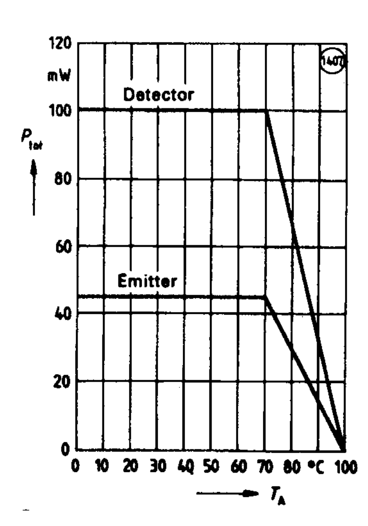


Figure 7. Forward current of emitting diodeversus forward voltage (T_A=25°C)

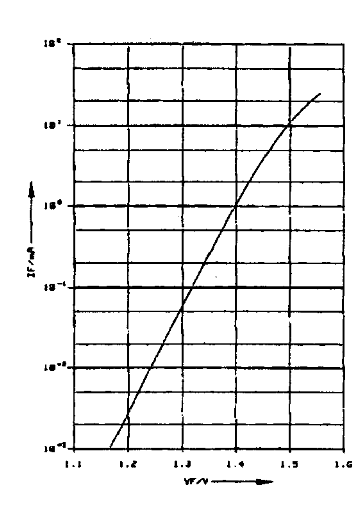


Figure 8. Small signal transfer ratio versus forward current (V_{CC}=5 V, T_A=25°C)

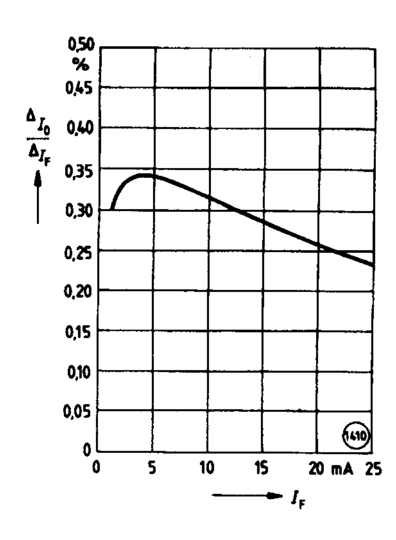


Figure 9. Current transfer ratio (normalized) versus ambient temperature (normalized to I_F=16 mA, V_O=0.4 V, V_{CC}=5 V, T_A=25°C)

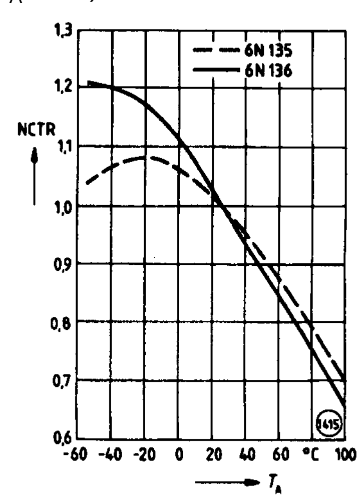


Figure 10. Output current (high)versus ambient temperature
(V_O=V_{CC}=5 V, I_F=0)

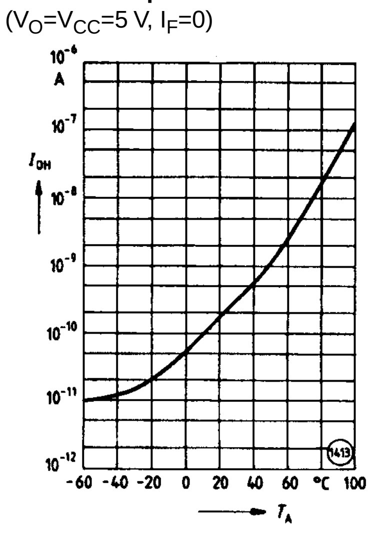


Figure 11. Delay times versus ambient temperature (I_F=16 mA, V_{CC}=5 V, 6N135: R_L=4.1 kΩ, 6N136: R_L=1.9 kΩ)

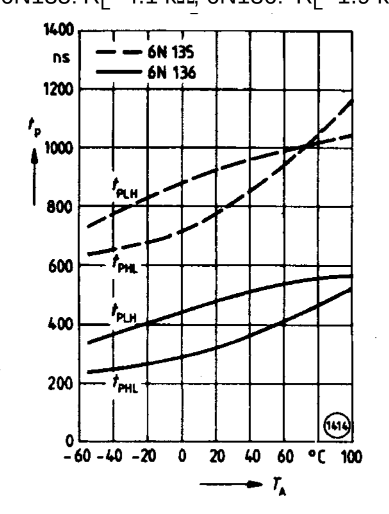


Figure 12. Current transfer ratio (normalized) versus forward current (I_F=16 mA, V_O=0.4 V, V_{CC}=5 V, T_A=25°C)

